Reviewer's report

Title: Prevalence and pattern of cognitive impairment in rural and urban populations from Northern Portugal

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Reviewer: Paulo R Menezes

Reviewer's report:

The manuscript presents the first Portuguese epidemiological study on the prevalence of dementia and cognitive impairment, comparing figures from rural and urban areas of Northern Portugal. This is interesting, since Portugal has a good proportion of its population living in rural areas and it has been through marked economic changes since it joined the EU, which may have some impact on the life style of its citizens, making Portugal an interesting setting for the investigation of the epidemiology of dementia along the life course. Overall, the manuscript is well written, allowing the reader understand what has been done and identify the major findings of the study. A strength of this work is the population-based sampling of participants. A major limitation is the very low response rate, with just over half of those sampled actually been included and assessed. In my view, this has been overlooked by the authors and a deeper reflection on its possible impacts on the results observed is needed. Another problem is the age range of participants, still too young for estimating the prevalence of dementia adequately. In fact, this resulted in a small number of participants with dementia, which did not allow adequate statistical power for the analysis of association.

- Major Compulsory Revisions

1. The abstract show some figures not given in the results of the main text. This must be reviewed. The conclusion is not based on the data shown.

2. The sample size calculation is not clear (p.2). First, the text states that it was based on a figure of 16% prevalence of cognitive impairment, without clarifying whether this includes cases of dementia or not. In the following sentence, the text says that the numbers of 710 in the rural area and 450 in the urban areas would allow identical precision of 9% for cognitive impairment.

3. The method section must have the reasoning for the age range choice, too young for a study aimed at estimating the prevalence and incidence of dementia in that region.

4. Calculation of chi-squares to compare sample characteristics and census data do not make sense. Firstly, because census data are not sampled, and therefore there is no sampling variation for such data. Secondly, they are not part of the present study, should be used in the discussion for considerations about the actual sample obtained in the study.
5. Use of statistical tests for comparing rural and urban samples is not very adequate as well, since both samples are relatively large and minimal differences, such as age mean (difference of one year between samples), can be statistically significant without being epidemiologically significant.

6. The analysis of cognitive impairment (dementia+cognitive impairment without dementia) comparing rural and urban settings was not justified nor described in the method. I would have preferred to see table 1 with numbers of cases of dementia and of CIND separately.

7. The pattern of associations between cognitive impairment and socio-demographic and clinical factors in urban and rural settings is not identical, and this must be better described.

8. The interaction between setting and age described in table 3 should be seen with caution, since it was not hypothesized a priori. Using age as a continuous variable does not allow the reader to assess what is going on in this supposed interaction.

9. The discussion is rather long and might be simplified, mainly because of the data limitations.

10. The possible impact of the high non-response is overlooked. The authors acknowledge that non-participation is probably due to the study logistics, asking eligible individuals to show up in the health centre for interviews and assessments. They argue that physical constraints and reduced collaboration among the eldest might have happened. In this case, the study would have underestimated the prevalence of dementia and CIND. On the other hand, one can imagine that with such young sample, many potential participants were well and working, without the time needed for their participation. In this situation, the study may have overestimated the prevalence of dementia and CIND. A more careful examination of characteristics of participants and non-participants is needed.

- Minor Essential Revisions

None.

- Discretionary Revisions

None.

1. Is the question posed by the authors well defined?
   Yes.

2. Are the methods appropriate and well described?
   Partially.

3. Are the data sound?
   No.

4. Does the manuscript adhere to the relevant standards for reporting and data
deposition?
Yes.
5. Are the discussion and conclusions well balanced and adequately supported by the data?
No.
6. Are limitations of the work clearly stated?
No.
7. Do the authors clearly acknowledge any work upon which they are building, both published and unpublished?
Yes.
8. Do the title and abstract accurately convey what has been found?
No.
9. Is the writing acceptable?
Yes.

**Quality of written English:** Acceptable